



TEST REPORT

Test Report No. : UL-RPT-RP10407435JD07B V2.0

Manufacturer : Apple Inc.
Model No. : A1601
FCC ID : BCGA1601
Technology : UMTS850 Band V
Test Standard(s) : FCC Part 22

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2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 2.0 supersedes all previous versions.

Date of Issue: 15 September 2014

Checked by:

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Issued by :

pp

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Quality Manager,
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This laboratory is accredited by UKAS.
The tests reported herein have been
performed in accordance with its' terms
of accreditation.

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1. Customer Information








Company Name:	Apple Inc.
Address:	1 Infinite Loop Cupertino, CA 95014 U.S.A

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR22
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 22 Subpart H (Public Mobile Services)
Site Registration:	209735
Location of Testing:	UL VS LTD, Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	01 August 2014 to 14 August 2014

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 22.913(a)(2)	Transmitter Effective Radiated Power (ERP)	
Part 2.1049	Transmitter Occupied Bandwidth	
Part 2.1053/22.917	Transmitter Out of Band Radiated Emissions	
Part 2.1053/22.917	Transmitter Band Edge Radiated Emissions	
Part 2.1055/22.355	Transmitter Frequency Stability (Temperature and Voltage Variation)	
Key to Results		
 = Complied  = Did not comply		

2.3. Methods and Procedures

Reference:	ANSI/TIA-603-C-2004
Title:	Land Mobile Communications Equipment, Measurements and performance Standards
Reference:	FCC KDB 971168 D01 v02r01, 7 June 2013
Title:	Measurement Guidance for Certification of Licensed Digital Transmitters

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Apple
Model Name or Number:	A1601
Test Sample IMEI:	352025060521607 (<i>Conducted Sample</i>)
Hardware Version Number:	REV 1.0
Software Version Number:	iOS 12A314 BB:3.08.08
FCC ID:	BCGA1601

Brand Name:	Apple
Model Name or Number:	A1601
Test Sample IMEI:	352025060511608 (<i>Radiated Sample</i>)
Hardware Version Number:	REV 1.0
Software Version Number:	iOS 12A314 BB:3.08.08
FCC ID:	BCGA1601

3.2. Description of EUT

The Equipment Under Test was a tablet with GSM/GPRS/EGPRS/UMTS and LTE. It also supports IEEE 802.11 a/b/g/n (MIMO 2x2) and Bluetooth®. The rechargeable battery is not user accessible.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Technology Tested:	UMTS850		
Type of Radio Device:	Transceiver		
Mode:	UMTS FDD V		
Modulation Type:	QPSK / 8PSK		
Channel Spacing:	5 MHz		
Power Supply Requirement(s):	Nominal	3.8 V	
	Minimum	3.4 V	
	Maximum	4.2 V	
Maximum Output Power (ERP):	RMC (12.2 kbps)	21.2 dBm	
	HSDPA Sub-Test 2	21.8 dBm	
	HSUPA Sub-Test 5	22.5 dBm	
Transmit Frequency Range:	824 to 849 MHz		
Transmit Channels Tested:	Channel ID	Channel Number	Channel Frequency (MHz)
	Bottom	4132	826.4
	Middle	4183	836.6
	Top	4233	846.6

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Brand Name:	Dell
Description:	Laptop computer
Model Name or Number:	Inspiron
Serial Number:	Asset RFI00788

Brand Name:	Not stated
Description:	USB Diagnostic cable
Model Name or Number:	Not stated
Serial Number:	Not stated

Brand Name:	Apple
Description:	USB Cable
Model Name or Number:	A1480
Serial Number:	Not stated

Brand Name:	Apple
Description:	USB Charger
Model Name or Number:	A1399
Serial Number:	Not stated

Brand Name:	Apple
Description:	PHF
Model Name or Number:	Apple Ear Plugs
Serial Number:	Not stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

The EUT was tested in the following operating mode(s):

- Constantly transmitting at full power on bottom, middle and top channels as required.
- Occupied bandwidth, ERP and band edge tests were performed with the EUT in RMC (12.2 kbps), HSDPA (Sub-tests 1 to 4) or HSUPA (Sub-tests 1 to 5) modes.
- Transmitter radiated spurious emissions were checked in all modes during pre-scans. RMC / 12.2 kbps was found to be the worst case and all final measurements were performed with the EUT in this mode.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- Connected to a Rohde & Schwarz CMW 500 Universal Radio Communications Tester, operating in UMTS Band V mode.
- Transmitter radiated spurious emission tests were performed with the EUT connected to a PHF and USB charger. The charger was connected to a 120 VAC 50 Hz supply. The EUT was placed in three orthogonal orientations X, Y and Z to determine the worst case orientation for radiated spurious emissions and all final measurements were performed in this orientation.
- Testing for frequency stability and measurements at temperature and voltage extremes was performed using a conducted sample supplied by the customer. Short 4-wire DC flying leads were connected internally to the device in place of the battery, and exited through a hole in the casing. These leads were then extended to a DC power supply for testing purposes.
- For conducted cellular measurements, the RF conducted port was created by removing a micro connector from the pcb antenna and extending it with a short flexible microstrip supplied by the customer. This microstrip exited the device through a hole in the casing and was terminated in a proprietary micro-coax to SMA adaptor.
- The conducted sample with IMEI 352025060521607 was used for frequency stability, conducted power and occupied bandwidth measurements.
- The radiated sample with IMEI 352025060511608 was used for all other measurements.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6. Measurement Uncertainty* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results**5.2.1. Transmitter Effective Radiated Power (ERP)****Test Summary:**

Test Engineer:	David Doyle	Test Date:	04 August 2014
Test Sample IMEI:	352025060521607		

FCC Reference:	Part 22.913(a)(2)
Test Method Used:	As detailed in KDB 971168 Section 5.1.1 and 5.2.1

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	35

Note(s):

- All modes were compared on each channel and the highest power recorded was subtracted from the limit to show the margin.
- The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable. An RF level offset was entered on the signal analyser to compensate for the loss of the attenuator and RF cable.
- The customer stated a maximum antenna gain of -2.95 dBi. As the limit is an ERP limit, the gain in dBi has been converted to dBd. The dBd was calculated as:

$$-2.95 \text{ dBi} - 2.15 \text{ dB} = -5.1 \text{ dBd.}$$

- The antenna gain was added to the conducted output power to obtain the ERP.

Results: Peak ERP / HSDPA and RMC

Modes		HSDPA				RMC			
Sub-test		1	2	3	4	12.2 kbps			
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result
850	4132	20.7	21.8	21.6	21.6	21.2	38.5	16.7	Complied
	4183	20.2	21.4	21.1	21.1	20.7	38.5	17.1	Complied
	4233	20.5	21.7	21.4	21.6	21.1	38.5	16.8	Complied
βc		2	11	15	15				
βd		15	15	8	4				
ΔACK, ΔNACK, ΔCQI		8	8	8	8				

Transmitter Effective Radiated Power (ERP) (continued)**Results: RMS ERP / HSDPA and RMC**

Modes		HSDPA				RMC				
Sub-test		1	2	3	4	12.2 kbps				
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result	
850	4132	14.6	14.7	14.1	14.1	15.8	38.5	22.7	Complied	
	4183	14.5	14.6	14.1	14.1	15.7	38.5	22.8	Complied	
	4233	14.7	14.7	14.2	14.1	15.7	38.5	22.8	Complied	
β_c		2	11	15	15					
β_d		15	15	8	4					
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8					

Results: Peak ERP / HSUPA

Modes		HSUPA								
Sub-test		1	2	3	4	5				
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result	
850	4132	21.5	20.9	22.3	20.8	22.5	38.5	16.0	Complied	
	4183	21.1	20.7	21.8	20.2	21.8	38.5	16.7	Complied	
	4233	21.5	20.9	22.1	20.6	22.0	38.5	16.4	Complied	
β_c		10	6	15	2	15				
β_d		15	15	9	15	1				
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8	8				

Results: RMS ERP / HSUPA

Modes		HSUPA								
Sub-test		1	2	3	4	5				
Band	Channel	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Power (dBm)	Limit (dBm)	Margin (dB)	Result	
850	4132	14.5	14.5	15.0	15.0	14.9	38.5	23.5	Complied	
	4183	14.3	14.3	14.8	14.7	14.7	38.5	23.7	Complied	
	4233	14.4	14.3	14.9	14.8	14.6	38.5	23.6	Complied	
β_c		10	6	15	2	15				
β_d		15	15	9	15	1				
$\Delta ACK, \Delta NACK, \Delta CQI$		8	8	8	8	8				

Transmitter Effective Radiated Power (ERP) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1657	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
A2504	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501839	Calibrated before use	-
A2526	Attenuator	AtlanTecRF	AN18W5-20	832828#1	Calibrated before use	-
M1873	Signal Analyser	Rohde & Schwarz	FSV30	103074	15 May 2015	12
M1269	Multimeter	Fluke	179	90250210	19 May 2015	12
S0523	DC Power Supply	TTI	PL320	224235	Calibrated before use	-

5.2.2. Transmitter Occupied Bandwidth**Test Summary:**

Test Engineer:	David Doyle	Test Date:	04 August 2014
Test Sample IMEI:	352025060521607		

FCC Reference:	Part 2.1049
Test Method Used:	As detailed in KBD 971168 Section 4.2

Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	35

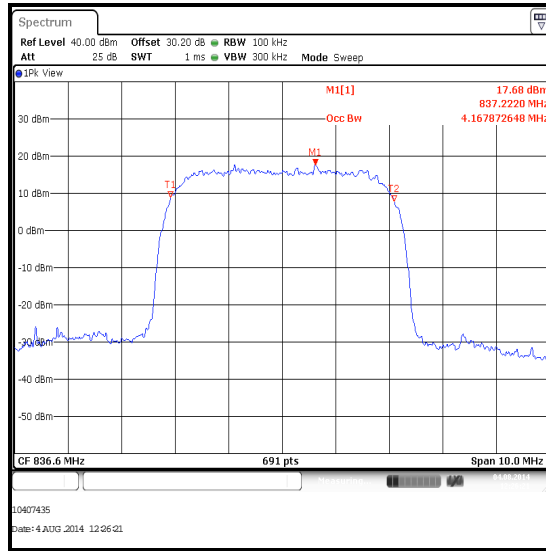
Note(s):

1. Occupied bandwidth (99% bandwidth) was measured using a signal analyser occupied bandwidth function.
2. The signal analyser was connected to the RF port on the EUT using suitable attenuation and RF cable.

Transmitter Occupied Bandwidth (continued)

Results: RMC / 12.2 kbps

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4167.873

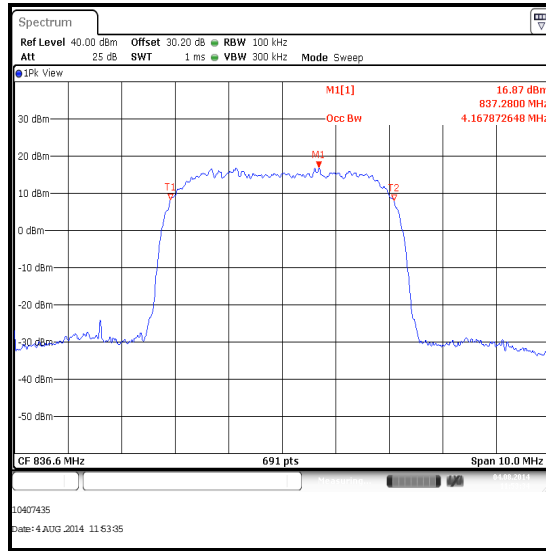


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 1

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4167.873

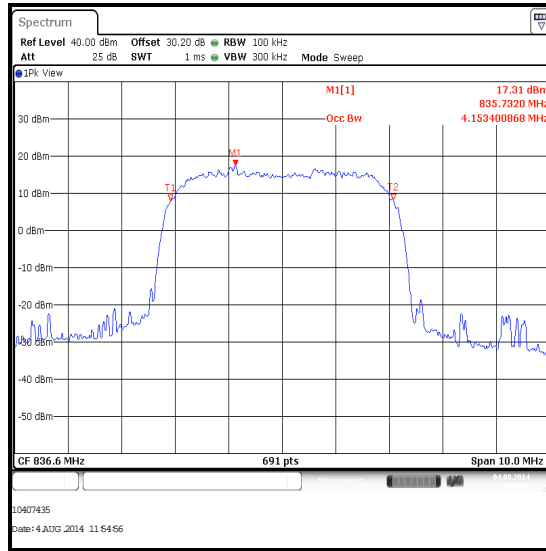


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 2

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4153.401

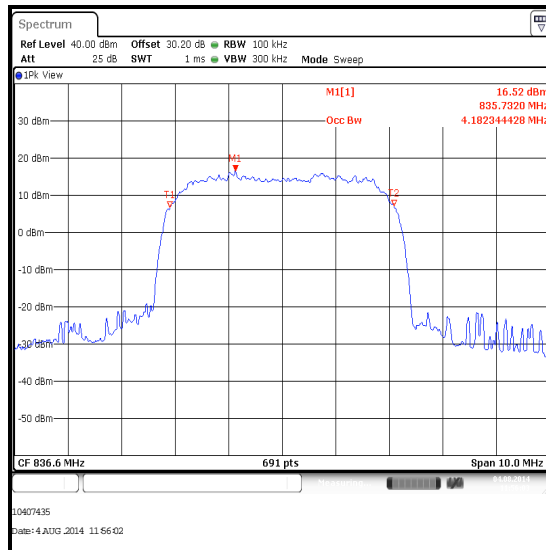


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 3

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4182.344

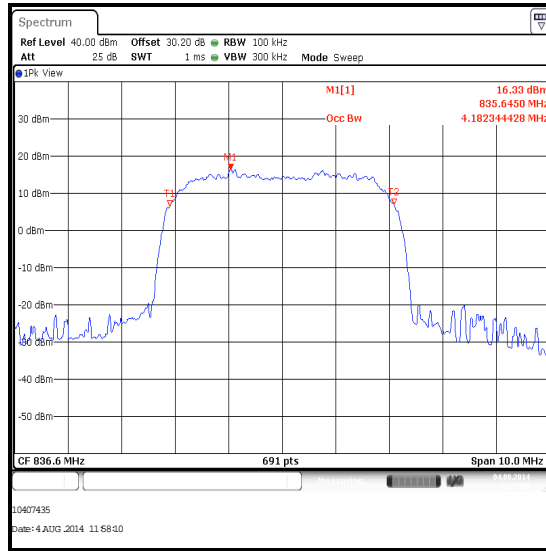


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSDPA Sub-Test 4

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4182.344

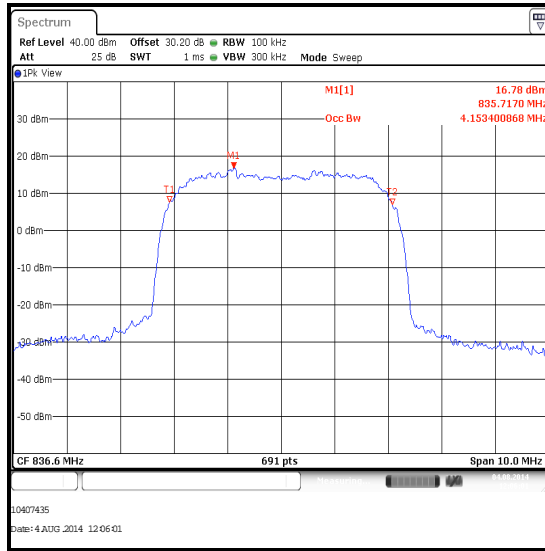


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 1

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4153.401

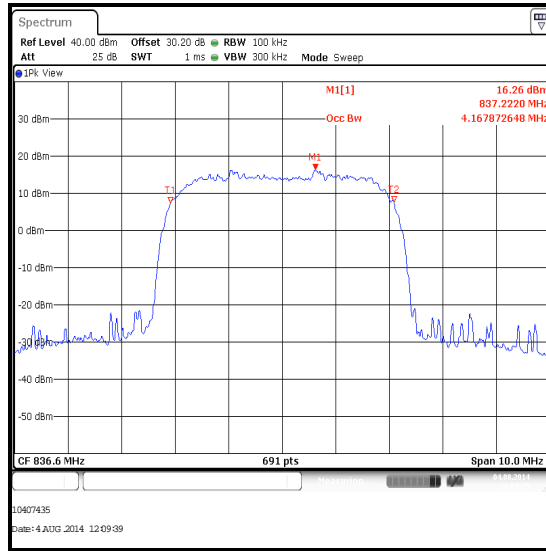


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 2

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4167.873

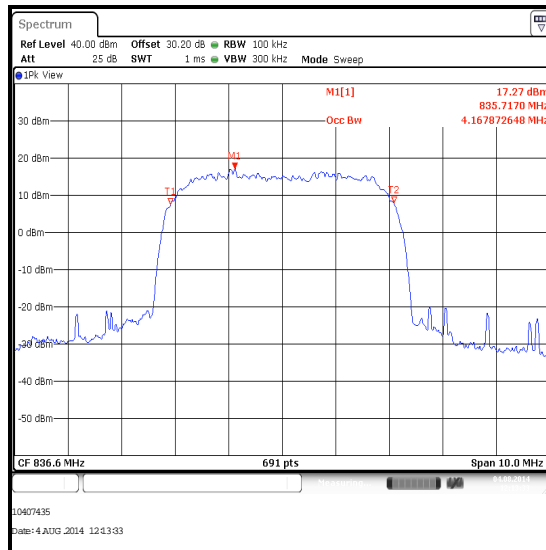


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 3

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4167.873

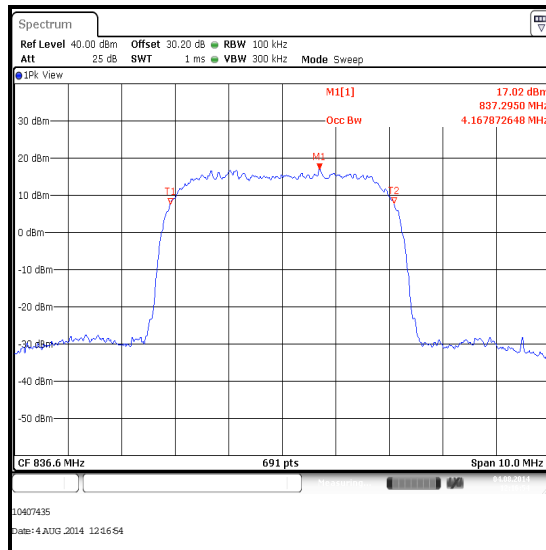


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 4

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4167.873

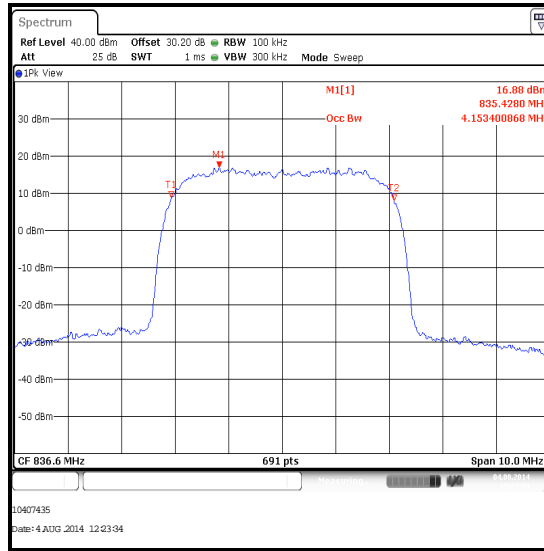


Middle Channel

Transmitter Occupied Bandwidth (continued)

Results: HSUPA Sub-Test 5

Channel	Frequency (MHz)	Occupied Bandwidth (kHz)
Middle	836.6	4153.401



Middle Channel

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1657	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
A2504	Directional Coupler	AtlanTecRF	CDC-003060-10	13122501839	Calibrated before use	-
A2526	Attenuator	AtlanTecRF	AN18W5-20	832828#1	Calibrated before use	-
M1873	Signal Analyser	Rohde & Schwarz	FSV30	103074	15 May 2015	12
M1269	Multimeter	Fluke	179	90250210	19 May 2015	12
S0523	DC Power Supply	TTI	PL320	224235	Calibrated before use	-

5.2.3. Transmitter Out of Band Radiated Emissions**Test Summary:**

Test Engineers:	David Doyle & Nick Steele	Test Dates:	01 August 2014 & 09 August 2014
Test Sample IMEI:	352025060511608		

FCC Reference:	Parts 2.1053 & 22.917
Test Method Used:	As detailed in KDB 971168 Section 6.1 referencing FCC Part 2.1053
Frequency Range:	30 MHz to 9 GHz
Configuration:	RMC / 12.2 kbps

Environmental Conditions:

Temperature (°C):	24 to 25
Relative Humidity (%):	31 to 46

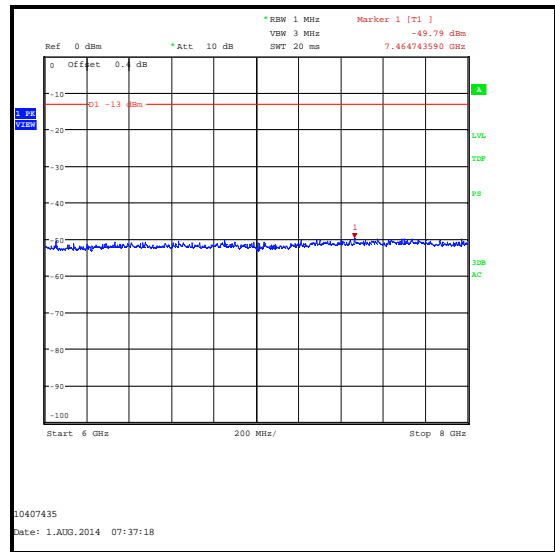
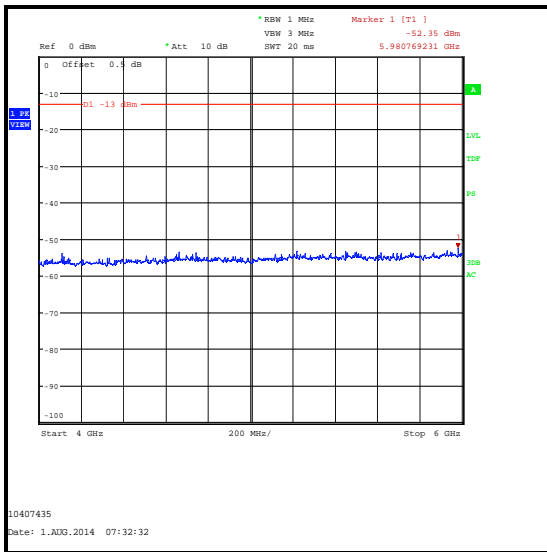
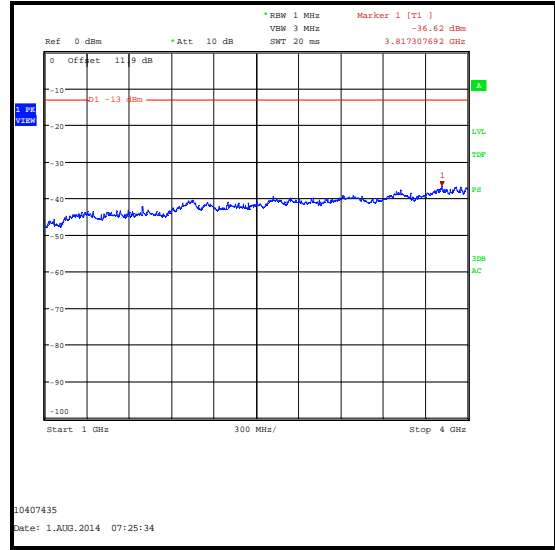
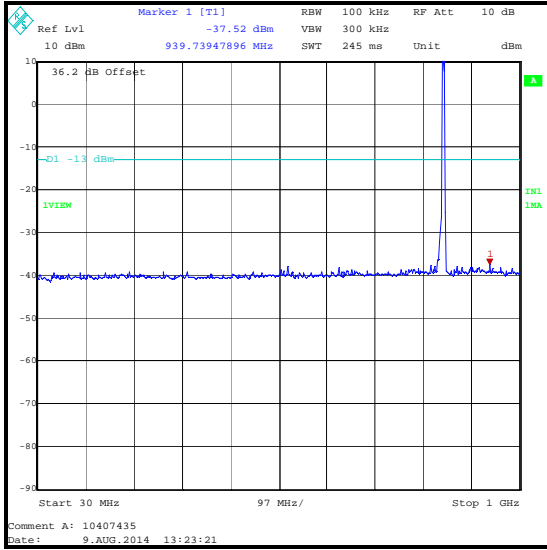
Note(s):

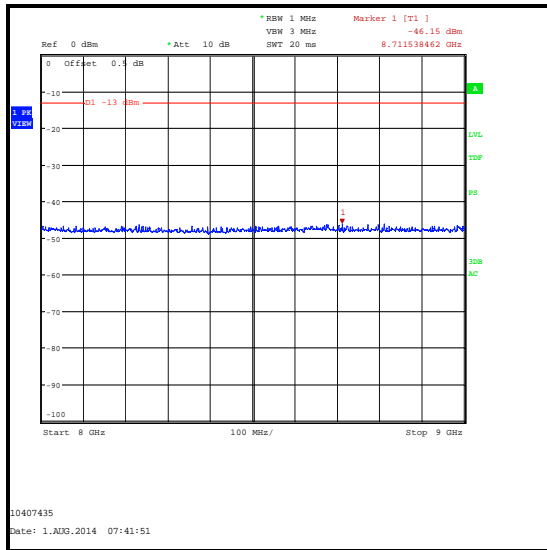
1. The uplink traffic channel is shown on the 30 MHz to 1 GHz plot.
2. No spurious emissions were detected above the noise floor of the measuring receiver; the highest peak noise floor reading of the measuring receiver was recorded.
3. Measurements below 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
4. Pre-scans above 1 GHz were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.

Results: RMC / 12.2 kbps - Top Channel

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
3817.308	-36.6	-13.0	23.6	Complied

Transmitter Out of Band Radiated Emissions (continued)



Transmitter Out of Band Radiated Emissions (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1622	Thermohygrometer	JM Handelspunkt	30.5015.06	None stated	31 Dec 2014	12
K0001	5m RSE Chamber	Rainford EMC	N/A	N/A	26 Nov 2014	12
M1273	Test Receiver	Rohde & Schwarz	ESIB 26	100275	15 Feb 2015	12
G0543	Amplifier	Sonoma	310N	230801	19 Aug 2014	3
A490	Antenna	Chase	CBL6111A	1590	29 Apr 2015	12
A1834	Attenuator	Hewlett Packard	8491B	10444	15 Nov 2014	12
A1393	Attenuator	Huber & Suhner	6820.17.B	757456	02 May 2015	12
M1656	Thermohygrometer	JM Handelspunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1534	Pre Amplifier	Hewlett Packard	8449B	3008A00405	18 May 2015	12
A1396	Attenuator	Huber & Suhner	6810.17.B	757987	02 May 2015	12
A1974	High Pass Filter	AtlanTechRF	AFH - 01000	090000283	12 Apr 2015	12
A1975	High Pass Filter	AtlanTechRF	AFH - 03000	090424010	12 Apr 2015	12
A1818	Antenna	EMCO	3115	00075692	14 Nov 2014	12
A253	Antenna	Flann Microwave	12240-20	128	14 Nov 2014	12
A254	Antenna	Flann Microwave	14240-20	139	14 Nov 2014	12
A255	Antenna	Flann Microwave	16240-20	519	14 Nov 2014	12

5.2.4. Transmitter Band Edge Radiated Emissions**Test Summary:**

Test Engineer:	David Doyle	Test Date:	01 August 2014
Test Sample IMEI:	352025060511608		

FCC Reference:	Parts 2.1053 & 22.917
Test Method Used:	As detailed in KDB 971168 Section 6.1 referencing FCC Part 22.917

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	46

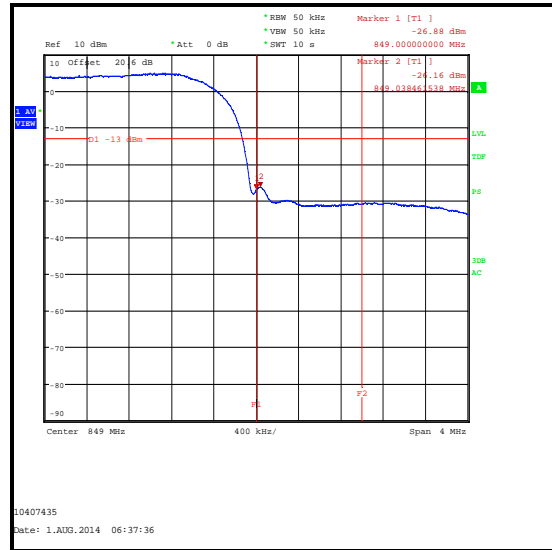
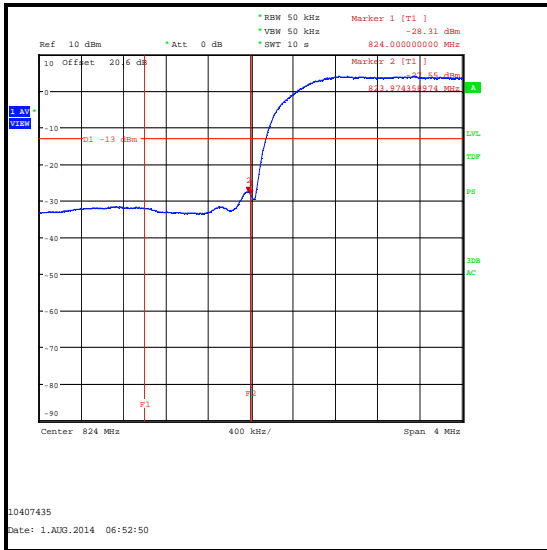
Note(s):

1. Measurements were performed with the EUT transmitting in all operating modes.
2. Measurements were performed in a fully anechoic chamber (Asset Number K0002) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. The measurement antenna was placed at a fixed height of 1.5 metres above the test chamber floor in line with the EUT.
3. In the first 1.0 MHz immediately outside and adjacent to the operating band, the test receiver resolution bandwidth was set to 50 kHz (>1% of 4.7 MHz, the widest 26 dB emission bandwidth) and video bandwidth 50 kHz (\geq the resolution bandwidth).

Transmitter Band Edge Radiated Emissions (continued)

Results: RMC / 12.2 kbps

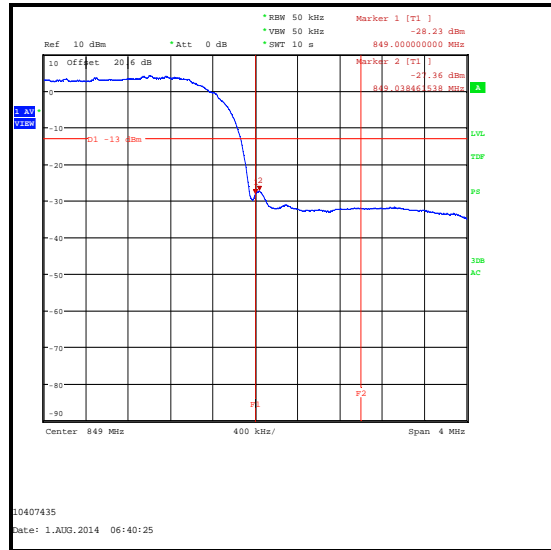
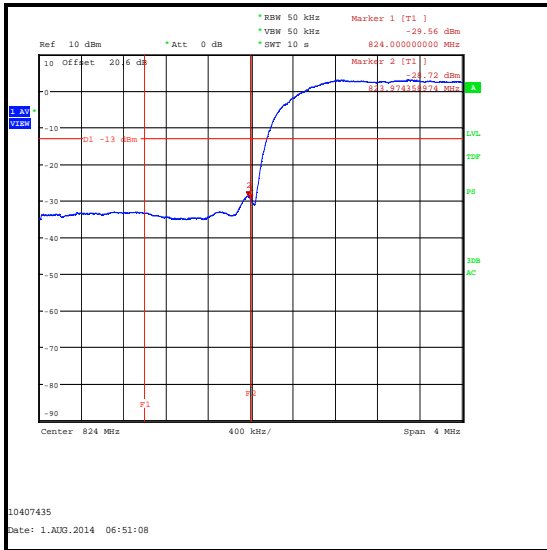
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.974	-27.6	-13.0	14.6	Complied
824	-28.3	-13.0	15.3	Complied
849	-26.9	-13.0	13.9	Complied
849.038	-26.2	-13.0	13.2	Complied



Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 1

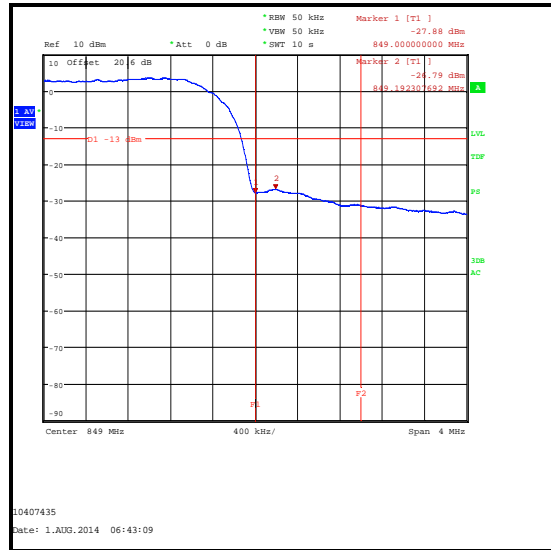
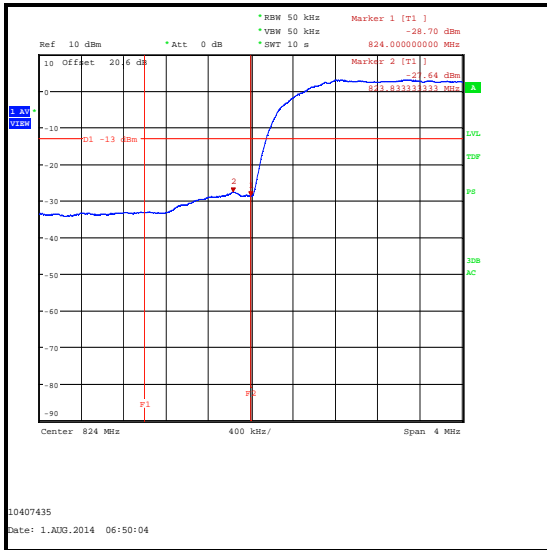
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.974	-28.7	-13.0	15.7	Complied
824	-29.6	-13.0	16.6	Complied
849	-28.2	-13.0	15.2	Complied
849.038	-27.4	-13.0	14.4	Complied



Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 2

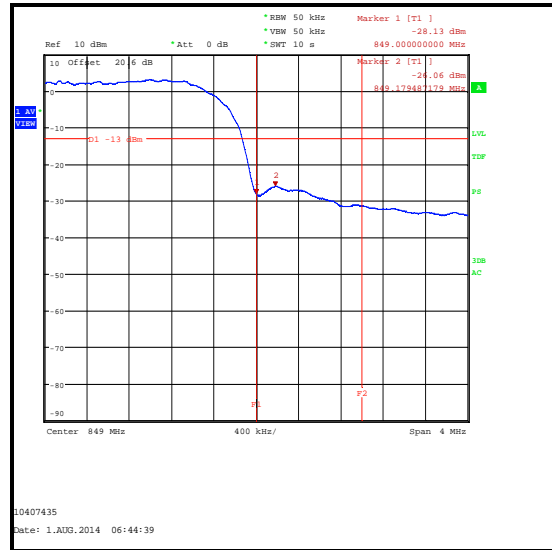
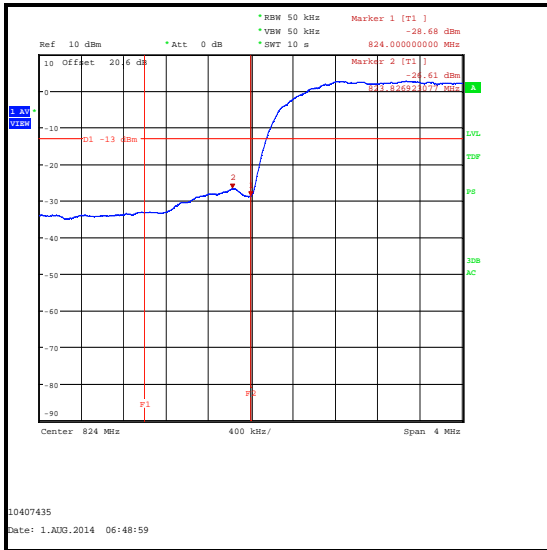
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.833	-27.6	-13.0	14.6	Complied
824	-28.7	-13.0	15.7	Complied
849	-27.9	-13.0	14.9	Complied
849.192	-26.8	-13.0	13.8	Complied



Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 3

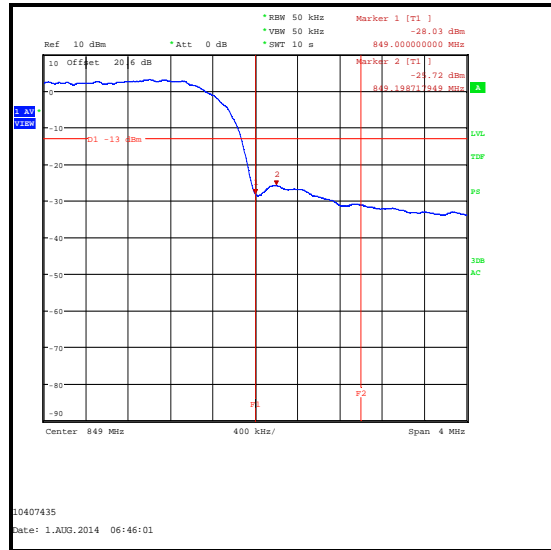
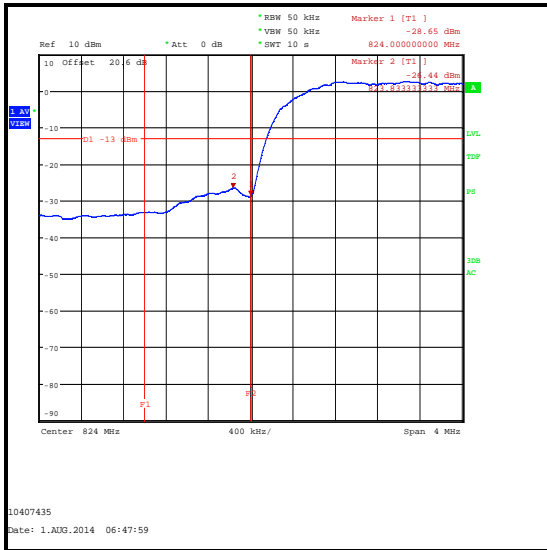
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.827	-26.6	-13.0	13.6	Complied
824	-28.7	-13.0	15.7	Complied
849	-28.1	-13.0	15.1	Complied
849.179	-26.1	-13.0	13.1	Complied



Transmitter Band Edge Radiated Emissions (continued)

Results: HSDPA Sub-Test 4

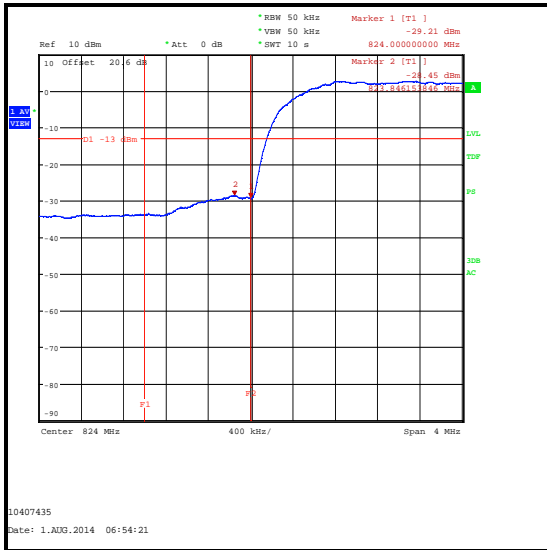
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.833	-26.4	-13.0	13.4	Complied
824	-28.7	-13.0	15.7	Complied
849	-28.0	-13.0	15.0	Complied
849.199	-25.7	-13.0	12.7	Complied



Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 1

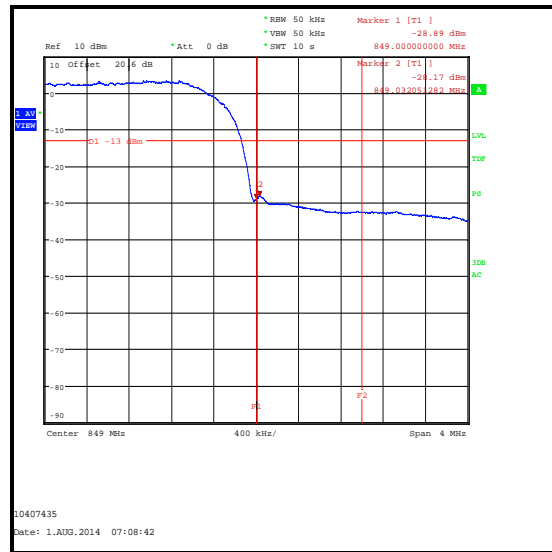
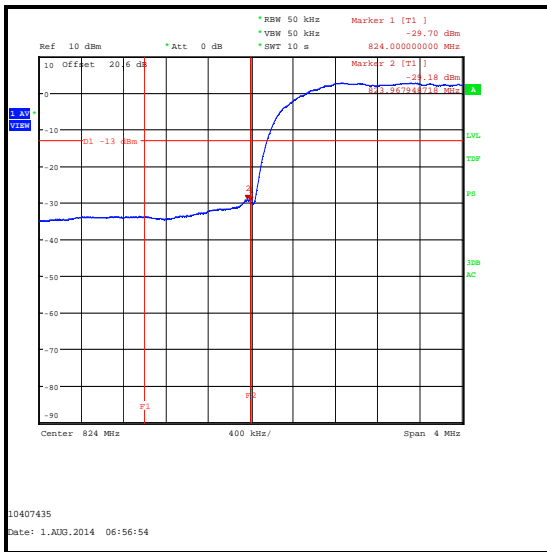
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.846	-28.5	-13.0	15.5	Complied
824	-29.2	-13.0	16.2	Complied
849	-28.5	-13.0	15.5	Complied
849.173	-27.6	-13.0	14.6	Complied



Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 2

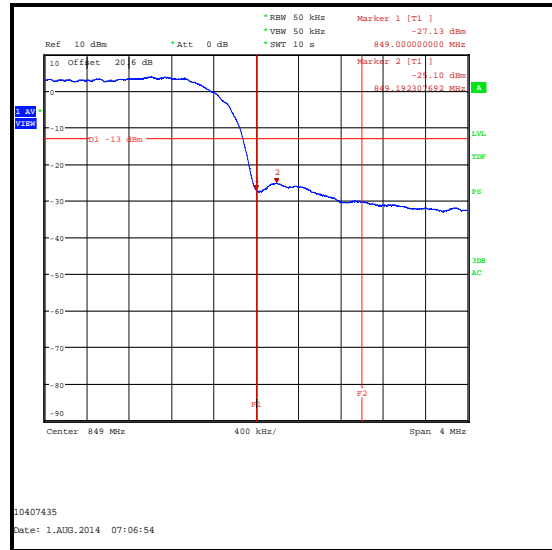
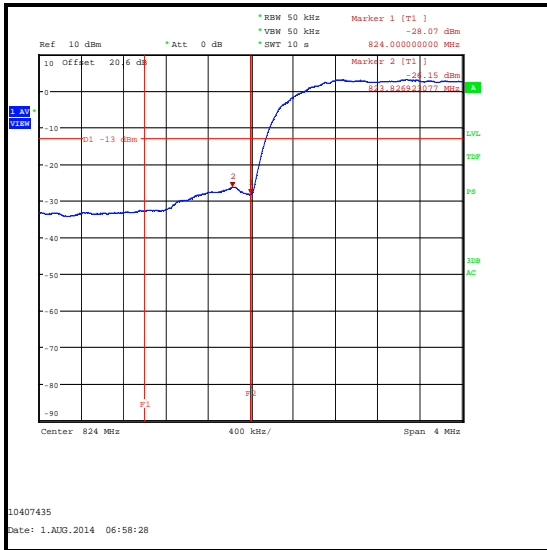
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.968	-29.2	-13.0	16.2	Complied
824	-29.7	-13.0	16.7	Complied
849	-28.9	-13.0	15.9	Complied
849.032	-28.2	-13.0	15.2	Complied



Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 3

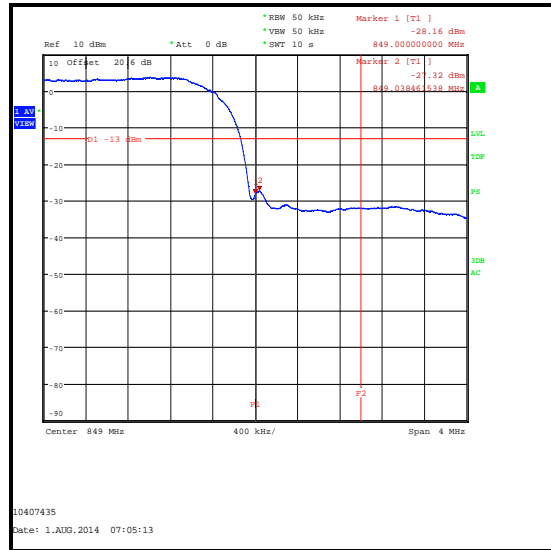
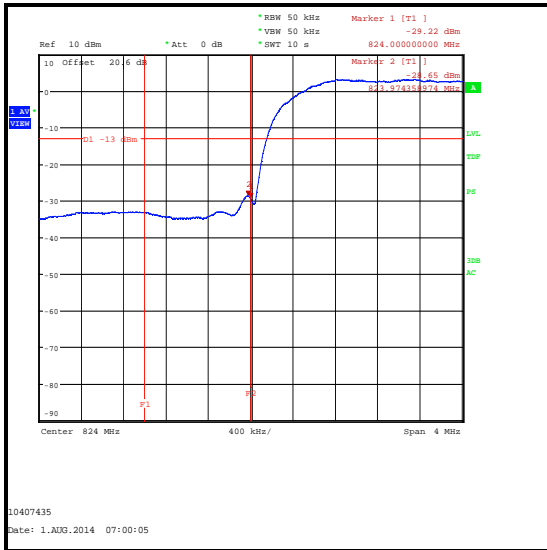
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.827	-26.2	-13.0	13.2	Complied
824	-28.1	-13.0	15.1	Complied
849	-27.1	-13.0	14.1	Complied
849.192	-25.1	-13.0	12.1	Complied



Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 4

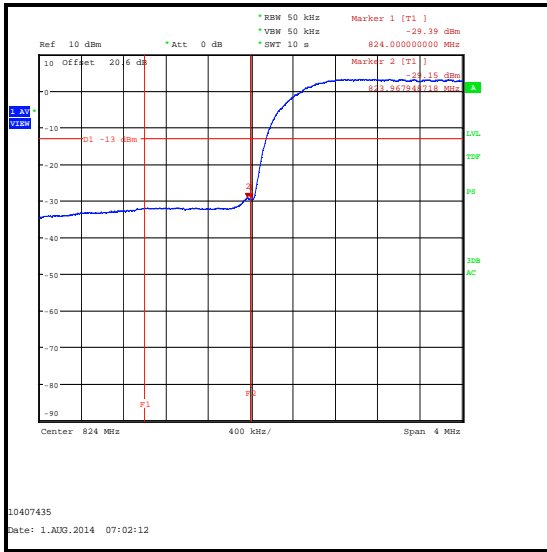
Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.974	-28.7	-13.0	15.7	Complied
824	-29.2	-13.0	16.2	Complied
849	-28.2	-13.0	15.2	Complied
849.038	-27.3	-13.0	14.3	Complied



Transmitter Band Edge Radiated Emissions (continued)

Results: HSUPA Sub-Test 5

Frequency (MHz)	Peak Level (dBm)	Limit (dBm)	Margin (dB)	Result
823.968	-29.2	-13.0	16.2	Complied
824	-29.4	-13.0	16.4	Complied
849	-28.5	-13.0	15.5	Complied
849.026	-28.2	-13.0	15.2	Complied



Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1656	Thermohyrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
K0002	3m RSE Chamber	Rainford EMC	N/A	N/A	14 Nov 2014	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	13 May 2015	12
A1393	Attenuator	Huber & Suhner	6820.17.B	757456	02 May 2015	12
A288	Antenna	Chase	CBL6111A	1589	20 Aug 2014	12

5.2.5. Transmitter Frequency Stability (Temperature Variation)**Test Summary:**

Test Engineer:	Keith Tucker	Test Date:	14 August 2014
Test Sample IMEI:	352025060521607		

FCC Reference:	Parts 2.1055 & 22.355
Test Method Used:	As detailed in KDB 971168 Section 9.0 referencing ANSI TIA-603-C-2004 Section 2.2.2 and FCC Part 2.1055
Test Mode:	RMC

Environmental Conditions:

Ambient Temperature (°C):	24
Ambient Relative Humidity (%):	38

Note(s):

1. Flying leads were connected internally to the EUT in place of the battery. These leads were extended and connected to a bench power supply.
2. Frequency error was measured using a calibrated Rohde & Schwarz CMW 500 Universal Radio Communications Tester in accordance with current Rohde & Schwarz application notes. The EUT was connected by suitable RF cables to the CMW 500. A bi-directional communications link was established between the EUT and CMW 500. The frequency meter value was recorded.
3. Temperature was monitored throughout the test with a calibrated digital thermometer.

Results: Middle Channel (836.6 MHz)

Temperature (°C)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
-30	836.599995	5	0.0060	2.5	2.4940	Complied
-20	836.600003	3	0.0036	2.5	2.4964	Complied
-10	836.600003	3	0.0036	2.5	2.4964	Complied
0	836.600003	3	0.0036	2.5	2.4964	Complied
10	836.600003	3	0.0036	2.5	2.4964	Complied
20	836.600004	4	0.0048	2.5	2.4952	Complied
30	836.600003	3	0.0036	2.5	2.4964	Complied
40	836.600003	3	0.0036	2.5	2.4964	Complied
50	836.600003	3	0.0036	2.5	2.4964	Complied

Transmitter Frequency Stability (Temperature Variation) (continued)**Test Equipment Used:**

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1657	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
M1869	Wideband Radio Comms Tester	Rohde & Schwarz	CMW500	145923	06 May 2015	12
S0523	DC power supply	TTi	PL320	224235	Calibrated before use	-
M122	Multimeter	Fluke	77	64910017	24 Apr 2015	12
M1643	Thermometer	Fluke	52II	18890136	07 Apr 2015	12
E0520	Environmental Chamber	Thermatron	S-1.2CB	S-1.2CB	Calibrated before use	-

5.2.6. Transmitter Frequency Stability (Voltage Variation)**Test Summary:**

Test Engineer:	Keith Tucker	Test Date:	14 August 2014
Test Sample IMEI:	352025060521607		

FCC Reference:	Parts 2.1055 & 22.355
Test Method Used:	As detailed in KDB 971168 Section 9.0 referencing ANSI TIA-603-C-2004 Section 2.2.2 and FCC Part 2.1055
Test Mode:	RMC

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	38

Note(s):

1. Flying leads were connected internally to the EUT in place of the battery. These leads were extended and connected to a bench power supply.
2. Frequency error was measured using a calibrated Rohde & Schwarz CMW 500 Universal Radio Communications Tester in accordance with current Rohde & Schwarz application notes. The EUT was connected by suitable RF cables to the CMW 500. A bi-directional communications link was established between the EUT and CMW 500. The frequency meter value was recorded.
3. Voltage was monitored throughout the test with a calibrated digital voltmeter.

Results: Middle Channel (836.6 MHz)

Supply Voltage (V)	Measured Frequency (MHz)	Frequency Error (Hz)	Frequency Error (ppm)	Limit (ppm)	Margin (ppm)	Result
3.4	836.599996	4	0.0048	2.5	2.4952	Complied
4.2	836.600003	3	0.0036	2.5	2.4964	Complied

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M1657	Thermohygrometer	JM Handelpunkt	30.5015.13	None stated	14 Mar 2015	12
M1869	Wideband Radio Comms Tester	Rohde & Schwarz	CMW500	145923	06 May 2015	12
S0523	DC power supply	TTi	PL320	224235	Calibrated before use	-
M122	Multimeter	Fluke	77	64910017	24 Apr 2015	12

6. Measurement Uncertainty

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

The uncertainty of the result may need to be taken into account when interpreting the measurement results.

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document "approximately" is interpreted as meaning "effectively" or "for most practical purposes".

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Conducted Output Power	824 to 849 MHz	95%	±1.13 dB
Frequency Stability	824 to 849 MHz	95%	±23 Hz
Occupied Bandwidth	824 to 849 MHz	95%	±3.92 %
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±5.65 dB
Radiated Spurious Emissions	1 GHz to 9 GHz	95%	±2.94 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version
2.0	-	-	Admin updates

--- END OF REPORT ---